MU Research Reactor Beryllium Reflector Changeout

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Collaborators: N/A

Program: Reactor Upgrades

ABSTRACT:

The Curators of the University of Missouri requests $585,013 from the DOE NEUP Reactor Upgrades Infrastructure Support Program to acquire a replacement beryllium reflector. MURR and MU are committing to a 1:1 cost match to DOE funds for acquiring the replacement reflector, the total cost of which is over $1,170,026. The objective of the reflector changeout project is to ensure the continued safe and reliable operations of the University of Missouri-Columbia Research Reactor (MURR) in order to facilitate research, education and service activities in fields related to each of the DOE Office of Nuclear Energy's program related areas: Fuel Cycle Research and Development, Reactor Concepts RD&D, and Nuclear Energy Advanced Modeling and Simulation. The benefit of this major initiative is to ensure the continued advancement of knowledge made possible through the infrastructural and technical capabilities available through MURR – a facility that supports significant research and workforce development activities in academic disciplines of interest to the Office of Nuclear Energy, including Materials Sciences and Engineering, Chemistry/Radiochemistry, and Applied Physics/Neutron Scattering.

Based on MURR's operating schedule of 10 MW and a 90% capacity factor since 1977, the beryllium reflector has been replaced four times – approximately every 26,000 MWD of reactor operation, or eight years. The last replacement occurred in January 2014, which requires that the next replacement installation to occur in late 2021 or early 2022. Replacement of the beryllium reflector is required due to two main nuclear materials science considerations: the irradiation induced swelling from the neutron fluence, and thermal induced tensile stress due to radiation heating of the beryllium material. The facility's first beryllium reflector cracked due to the combined stresses before it was replaced in 1981, which resulted in significant disruption of research and educational activities. A major goal of all MURR maintenance and upgrade activities is to avoid even minor disruptions in facility usage for faculty-student research and other investigators.

The PI and Co-PI will coordinate with MURR's senior engineering and operations managers for the beryllium reflector replacement initiative. This work will be conducted in two major phases over an 18 month period (requested due to the long lead time needed for reflector fabrication and delivery).

Phase 1: Procurement. This phase of the project involves contracting the production of a beryllium reflector to comply with tight specifications on material impurities and dimensional tolerances. From the time a purchase order is accepted by the vendor, a 41-week lead time is anticipated for fabrication of the new reflector and its delivery to MURR. This requires starting the procurement process at the beginning of FY 2021, at the latest. This schedule is the basis for MU's request for a 1.5 year period of support.

Phase 2: Installation. While the reflector is being fabricated, final facility schedules will be developed to conduct the outage required to ensure safe, accurate, and efficient installation, with a major goal of minimizing facility downtime for faculty and student research activities. Based on accumulated fluence in the facility's current reflector, the replacement unit will need to be ready for installation in December 2021/ January 2022.